Claims

1.   A double-screw compressor for supplying gas, such
as air, to a gas consumer, such as a fuel cell or an
internal combustion engine, and comprising two
interacting rotors for compressing the gas and also a
toothed gearing, which toothed gearing comprises:
-       a housing with two opposite end walls which are
made of a first material,
-       two parallel gearwheel shafts, which are each
connected to one of the rotors and mounted rotatably in
the opposite end walls with a nominal center distance,
-       two interacting gearwheels which are fixed on a
respective gearwheel shaft and made of a second
material, each gearwheel having involute teeth
corresponding to one another designed so as, when
engagement between teeth on their respective wheels
takes place, to form a nominal backlash between the
teeth interacting during the engagement, when the
gearwheel shafts are located at the nominal center
distance from one another, and
-       the first and second materials having different
thermal expansion coefficients, **characterized in** that
each of the gearwheels is designed with one and the
same nominal pressure angle which is smaller than 15°
in order to minimize the deviation of the actual
backlash from the nominal backlash when the center
distance deviates from the nominal center distance as a
consequence of a change in temperature of one of the
parts included in the screw compressor.

2.   The double-screw compressor as claimed in claim 1,
in which the two gearwheels are designed with a nominal
pressure angle which lies in the range 8° to 15°.

3.   The double-screw compressor as claimed in claim 1
or 2, in which the two gearwheels are designed with the
nominal pressure angle of around 10°.

4.   The double-screw compressor as claimed in any one
of claims 1-3, in which the first material is aluminum
and the second material is steel.

5   5.   The double-screw compressor as claimed in any one
of claims 1-4, in which the nominal center distance is
slightly greater than the normal center distance for
toothed gearings, A_{norm}, which is calculated according
to the formula:

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$$A_{norm} = ((m_1 \cdot z_1)/2\cos\beta_1)) + ((m_2 \cdot z_2)/2\cos\beta_2))$$

where m is the module, z is the number of teeth and β
is the helix angle and where the index numbers $_1$ and $_2$
15   represent one and the other gearwheel respectively.

6.   The double-screw compressor as claimed in claim 5,
in which the nominal center distance lies within the
range 1.0 · A_{norm} to 1.0016 · A_{norm} and is preferably
20   equal to around 1.0014 · A_{norm}.

7.   The double-screw compressor as claimed in any one
of   claims   1-6,   in   which $m_1=m_2=1$, $z_1=30$, $z_2=60$,
$d_1=33.480$ mm, $d_2=66.960$ mm, and $\beta_1=\beta_2=26.355°$, where m
25   is   the   module,   z   is   the   number   of   teeth,   d   is   the
reference diameter and β is the helix angle and where
the index numbers $_1$ and $_2$ represent one and the other
gearwheel respectively.

30   8.   A method of, in a double-screw compressor for
supplying gas, such as air, to a gas consumer, such as
a fuel cell or an internal combustion engine, reducing
the effect of temperature variations of parts in the
double-screw   compressor   on   the   functioning   of   the
35   double-screw   compressor,   which   double-screw   compressor
comprises two interacting rotors for compressing the
gas and also a toothed gearing, where:
(A) the toothed gearing is designed with:

- a housing with two opposite end walls which are made of a first material,
- two parallel gearwheel shafts, which are each connected to one of the rotors and mounted
5   rotatably in the opposite end walls with a nominal center distance,
- two interacting gearwheels which are fixed on a respective gearwheel shaft and made of a second material, each gearwheel having involute teeth
10   corresponding to one another designed so as, when engagement between teeth on their respective wheels takes place, to form a nominal backlash between the teeth interacting during the engagement, when the gearwheel shafts are located
15   at the nominal center distance from one another, and

(B) the first and second materials are selected so that they have different thermal expansion coefficients, **characterized in** that

20   (C) the pressure angle of the gearwheels is adapted in order to minimize the deviation of the actual backlash from the nominal backlash when the center distance deviates from the nominal center distance as a consequence of a change in temperature of one of the

25   parts included in the screw compressor.

9.   The method as claimed in claim 8, the nominal pressure angle of the gearwheels being selected as a nominal pressure angle common to both gearwheels within

30   the range 0° to 15°, preferably within the range 8° to 15° and more preferably to be around 10°.

10.   The method as claimed in either claim 8 or 9, aluminum being selected as the first material and steel

35   being selected as the second material.

11.   The double-screw compressor as claimed in any one of claims 8-10, the nominal center distance being selected to be slightly greater than the normal center

distance for toothed gearings, A_{norm}, which is calculated according to the formula:

$$A_{norm} = ((m_1 \cdot z_1)/2\cos\beta_1)) + ((m_2 \cdot z_2)/2\cos\beta_2))$$

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where m is the module, z is the number of teeth and β is the helix angle and where the index numbers $_1$ and $_2$ represent one and the other gearwheel respectively.

10   12. The method as claimed in claim 11, the nominal center distance being selected within the range $1.0 \cdot A_{norm}$ to $1.0016 \cdot A_{norm}$ and preferably being selected to be around $1.0014 \cdot A_{norm}$.